Volume 101, Number 5, September–October 1996
Journal of Research of the National Institute of Standards and Technology

News Briefs

General Developments

Inquiries about News Briefs, where no contact person is identified, should be referred to the Managing Editor, Journal of Research, National Institute of Standards and Technology, Building 820, Room 126, Gaithersburg, MD 20899-0001; telephone: 301/975-3572.

PARTNERS TO AGREE ON PKI BASICS

NIST is joining with several companies to take steps toward developing the elements of a public key infrastructure. This will make it possible to send and receive digitally signed documents among organizations and individuals who may never have met. NIST has established cooperative research and development agreements with 10 companies. The partnerships aim to develop a minimum interoperability specification—sort of a least common denominator for the technical pieces of a PKI—to be publicly available for organizations to use in building PKI components. By working with NIST, the companies are helping to ensure that future PKI components will be able to communicate with each other, much as today's fax machines can receive transmissions from each other regardless of brand name or manufacturer. A PKI is necessary to enable large-scale use of digital signatures and other forms of public key cryptography by both government and private-sector users.

DARTS SCORES A BULLSEYE IN EVALUATING STRESS

A new instrument at the NIST Research Reactor will give materials scientists an atomic-scale view of how mechanical stress is produced in rail lines, tools, and machine parts made of crystalline materials such as metals and ceramics. The new double axis diffractometer for residual stress, texture, and single crystal analysis, or DARTS, performs faster and with higher resolution than an older neutron spectrometer which had been used for these measurements. Residual stress measurements can provide valuable data to help predict when material failure or fracture is likely to occur. Analogous to x-ray diffraction, DARTS uses neutron diffraction to measure strains through changes in interatomic spacing in polycrystalline materials with very high accuracy. However, since neutrons are more deeply penetrating than x rays, neutron diffraction provides information otherwise unobtainable. The design of the new instrument allows measurements 10 times faster than previously possible. For more information on DARTS, contact Paul Brand, (301) 975-5072, e-mail: paul.brand@nist.gov, or Henry Prask, (301) 975-6226, e-mail: henry.prask@nist.gov. Both may be reached by mail at E151 Reactor Building, NIST, Gaithersburg, MD 20899-0001, fax: (301) 921-9847.

A NEW "TWIST" SOLVES AN OLD PROBLEM

Stress-induced linear birefringence can be removed by heating optical fibers above 500 °C and cooling slowly. But for certain applications, such as optical current sensors, this initial heat treatment is not enough because the fiber's core shape is elliptical. An ellipticity of about 1 % in the fiber core—an amount difficult to measure—can produce a linear birefringence that is too much for current-sensing applications. As a solution, researchers at NIST several years ago proposed twisting the fiber every meter or so, before heating it to temperatures in the 800 °C to 850 °C range. In a new paper, they show that the process sharply reduces the measured linear birefringence in the fiber coils. This increases the yield of the annealing process, making it possible to use virtually any telecommunications-grade single-mode fiber for current sensing. For a copy of paper no. 16-96, contact Sarabeth Harris, Div. 104, NIST, Boulder, CO 80303-3328, (303) 497-3237, e-mail: sarabeth@micf.nist.gov.

PAPERS ON TRAPPED IONS AND LASER COOLING PUBLISHED

NIST scientists design techniques for high-resolution spectroscopy, especially as it pertains to the development of extremely accurate and stable atomic frequency and time standards. It also investigates related areas such as laser stabilization, quantum state control, quantum noise, quantum logic gates, light scattering from single atoms, ion plasmas, and single-electron dynamics. The the scientiests have collected 22 papers on these topics, dating from May 1992 to January 1996, into a single volume, Trapped Ions and Laser Cooling IV (NIST Technical Note 1380). The publication also includes a bibliography of 21 additional papers not in the collection. TN 1380 is available for $13 prepaid from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402, (202) 512-1800. Order by stock no. 003-003-03395-2.

BETTER LAB ACCREDITATION ENVISIONED FOR FUTURE

A vision for U.S. laboratory accreditation in the 21st century has been developed that defines an improved national system that could eliminate duplication of effort, save money and increase U.S. competitiveness in domestic and global markets. This vision for improving laboratory accreditation in the United States was presented at a recent open forum sponsored by NIST at the request of the American National Standards Institute and ACIL, formerly known as the American Council of Independent Laboratories. This view of the future describes a U.S. system that could lead to a cooperative relationship between the public and private sectors. In turn, such a relationship would result in a simplified system whereby a testing laboratory will be accredited in a given field of testing, with worldwide recognition of the laboratory's competence; and the user will benefit from a test performed once, with worldwide acceptance of the assessment. The vision statement was developed by the steering group of the Laboratory Accreditation Working Group. Copies of the report, Proceedings of the Open Forum on Laboratory Accreditation (SP 902), are available from Office of Standards Services, Room 282 Building 820, NIST, Gaithersburg, MD 20899-0001, (301) 975-4000, fax: (301) 963-2871.

HIGH-ALTITUDE SENSING GETS LIFT IN ACCURACY

The new NIST Facility for Advanced Radiometric Calibration, or FARCAL, will boost the accuracy of remote sensing instruments used in global warming and climate research. FARCAL will help ensure the reliability of data used to shape future environmental policy. It also will help improve the accuracy of remote sensing used in defense and industrial applications and resource management. FARCAL will facilitate industry's use of the national radiometric standard, which allows the accuracy of radiometric data to be traced to a single source: NIST. With this standard, researchers can compare data collected with different instruments in different parts of the world. FARCAL also will cover a wide range of radiometer calibration needs. In addition, the facility will hold training exercises and workshops for radiometer manufacturers and users. NIST developed FARCAL in response to NASA's request for assistance in assessing the reliability and comparability of measurements made by radiometers on different Earth-orbiting satellites. For more information, contact Carol Johnson, B208 Physics Building, NIST, Gaithersburg, MD 20899-0001, (301) 975-2322, e-mail: b.johnson@nist.gov.

NIST, RUSSIAN AGENCY PLEDGE SCIENTIFIC COOPERATION

A memorandum of understanding (MOU) between NIST and the Russian Academy of Sciences for scientific and technical cooperation in the physical, chemical and engineering sciences was signed on July 15, 1996. The MOU outlines scientific cooperation of mutual interest that may be conducted in the areas of theoretical and experimental physics, chemistry and engineering sciences. Cooperative activities may include exchanges of scientists, information, seminars and joint research projects. Cooperation between NIST and the RAS, formerly the USSR Academy of Sciences, dates back to the late 1970's. NIST also has similar agreements for scientific cooperation with such countries as Canada, China, Egypt, France, Italy, Japan, Mexico, the Republic of Korea, South Africa and the United Kingdom. For information, contact Claire Saundry, Office of International and Academic Affairs, A505 Administration Building, NIST, Gaithersburg, MD 20899-0001, (301) 975-3069, fax: (301) 975-3530, e-mail: OIAA@nist.gov.

SPECTROSCOPIC REFERENCE DATA NOW NEW AND IMPROVED

A new edition of a widely cited reference volume of spectroscopic data has been issued by NIST. Atomic Transition Probabilities of Carbon, Nitrogen and Oxygen-A Critical Data Compilation is a greatly improved and expanded update to tables previously published by the National Bureau of Standards (now NIST) in 1966. Scientists in atmospheric physics,

astrophysics, nuclear fusion, plasma processing and related fields will find this volume a valuable resource. The 532-page reference data book contains critically evaluated atomic transition probabilities for all ions and neutral atoms of carbon, nitrogen and oxygen. The new edition contains 12 500 spectral lines, nearly 10 times as many as the previous edition. Neutral carbon, nitrogen, and oxygen atoms and their singly charged ions are covered in the greatest detail, with nearly 1000 lines each. Atomic Transition Probabilities of Carbon, Nitrogen and Oxygen-A Critical Data Compilation is available for $130 from the American Chemical Society, 1155 16th St. NW, Washington, DC 20036, fax: (202) 872-6067, e-mail: kxw96@acs.org. Within the United States, the volume can be ordered by phoning (800) 227-5558. Select menu options 9, 1 and 1 to be connected to a salesperson.

UNITED STATES, SOUTH AFRICA TO COOPERATE IN SCIENCE AND TECHNOLOGY

To advance international cooperation in science and technology between the United States and the Republic of South Africa, as well as the entire South African region, NIST and the Council for Scientific and Industrial Research (CSIR) of South Africa signed an agreement in the fields of chemistry, physics and engineering measurements. The agreement was established under the auspices of the Science and Technology Committee of the U.S./South African Binational Commission. It provides a framework for exchanging scientific and technical knowledge, providing services and augmenting scientific and technical capabilities of NIST and CSIR. CSIR is a private entity established under the terms of the South African Research Council Act of 1988 to represent that nation in developing technology for competitiveness, development and decision making. CSIR is interested in cooperating with NIST in areas of materials, manufacturing and building technology as well as calibrations and measurement intercomparisons. The agreement will help provide the necessary foundation in science and measurements to enhance trade between the two countries. CSIR is currently expanding its role as a leader in standards and metrology, and as an advisor to other national laboratories in the region. For information, contact the Office of International and Academic Affairs, A505 Administration Building, NIST, Gaithersburg, MD 20899-0001, (301) 975-3069, fax: (301) 975-3530, e-mail: OIAA@nist.gov.

SPECIALIZED RADIOMETER DEVELOPED FOR LASERS

NIST scientists have designed, built and characterized a specialized radiometer for measuring very low levels of pulsed laser radiation produced by Q-switched lasers operating at a wavelength of 1064 nm. The instrument combines the functions of peak power and pulse energy measurement into one unit, improving the responsivity by two orders of magnitude greater than previous NIST designs calibrated at 1064 nm. The radiometer is based on an infrared-enhanced silicon avalanche photodiode with 100 mm-diameter full aperture collecting optics. Selectable aperture sizes and a neutral density filter extend the measurement range of the instrument to higher levels, especially with large diameter beams. The output is a voltage waveform that can be measured with an oscilloscope. Calibration uncertainty for the radiometer is typically less than 8 %; improvements in the NIST calibration system may reduce this to 5 %. For a copy of paper 22-96 that describes this new radiometer, contact Sarabeth Harris, Div. 104, NIST, Boulder, CO 80303-3328, (303) 497-3237, e-mail: sarabeth@micf.nist.gov.

GUIDE TO ELECTRONICS PACKAGING AT NIST PUBLISHED

Electronics Packaging, Interconnection and Assembly at NIST: Guide and Resources (NISTIR 5817) is an inventory of research projects supported by NIST in a technology critical to the U.S. microelectronics industry. The guide outlines NIST's laboratory-based efforts that support the measurements and standards infrastructure of the industry in semiconductor packaging, electronic interconnection and assembly. The guide contains information from more than 25 principal NIST investigators and managers who are working collaboratively with researchers and manufacturers from 60 U.S. microelectronics and materials companies, consortia, trade associations, standards bodies, universities, and other government agencies. For a copy of NISTIR 5817, contact Michael A. Schen, B320 Polymer Building, NIST, Gaithersburg, MD 20899 -0001, (301) 975-6741, fax: (301) 869-3229, e-mail: michael.schen@nist.gov. The guide soon will be available on the World Wide Web at http://www.msel.nist.gov.

PARTNERS DEVELOP ULTRASENSITIVE BOLOMETER

NIST and a private compan have partnered under a cooperative research and development agreement to produce an extremely sensitive high-temperature superconducting bolometer for infrared imaging purposes. It utilizes a novel all-epitaxial micromachining technology based on a yttrium-barium-copper-oxide thin film on a yttria-stabilized, free-standing zirconia membrane. Currently, semiconductor devices are used for infrared

detection at short wavelengths. Helium-cooled superconducting bolometers can be used at longer wavelengths, but they are prohibitively expensive. The bolometer has attained a sensitivity of 0.6 $pW/\sqrt{Hz}$, far better than the helium-cooled or other superconducting bolometers at such long wavelengths. The previous record was 1.5 $pW/\sqrt{Hz}$. The new bolometer has application for infrared video cameras on Earth-orbiting satellites to monitor the upper atmosphere for greenhouse gases. It also has applications for specialized night vision equipment and for use as a detector of clear air turbulence. Both NASA and the European Space Agency are interested in the NIST-private company development. NASA and ESA have been looking for a bolometer that is cheaper, easier and faster—requirements that the new bolometer should meet. For a copy of paper 24-96 describing the bolometer, contact Sarabeth Harris, Div. 104, NIST, Boulder, CO 80303-3328, (303) 497-3237, e-mail: sarabeth@micf.nist.gov.

CLARIFY SCREW-THREAD STANDARDS, REPORT SAYS

A NIST-commissioned review of gaging systems used to measure thread characteristics and elements of bolts, nuts and other fasteners recommends clarifying and consolidating national standards to eliminate confusion over the most appropriate use of each inspection method. An independent panel of experts, convened by the American Society of Mechanical Engineers (ASME), found "very little" data to substantiate occasional allegations that out-of-tolerance screws played a role in major mechanical and structural failures. The panel also noted, however, that the specter of liability suits has impeded exchanges of proprietary technical information, thwarting research to establish how dimensional variations affect fastener performance. It called for efforts to create a public-domain database that would permit definitive study of the issue. The ASME standard for "dimensional acceptability" lists three gaging systems and advises that the choice of a particular method should reflect the demands of the intended fastener application. One method, System 21, was determined by the panel to provide some measure of control but could not assure dimensional conformance. In contrast, System 22 and the even more rigorous System 23 method can check conformance with a variety of specifications. Although it noted that, when properly used, current screw-thread gaging standards are satisfactory for their intended use, the panel recommended creating one consensus standard, supplanting various military and federal standards with one maintained by ASME. After reviewing the report, the Nuclear Regulatory Commission asked ASME to clarify its code and standards "to avoid future disagreements in interpretations."

MIDEAST NEIGHBORS SEEK STANDARDS HARMONY

Four of the participating entities in the Middle East peace process—Egypt, Israel, Jordan and the Palestinian Authority—will meet this fall NTo continue efforts to harmonize standards and develop a regional market for each other's goodsM. NIST will serve as a facilitator at the meeting, sharing information on the U.S. standards and development process with Middle Eastern officials. The meeting will build on the success of the March 1996 Taba Seminar on Standards and Metrology in Cairo, Egypt. At that seminar, a working group from the Egyptian National Institute of Standards, the Standards Institute of Israel, the Jordanian Institution for Standards and Metrology, and the Institute of Standards of the Palestinian Authority agreed to a pilot project to harmonize standards for food processing, including olive oil, tomato paste and processed meat; and standards for cement and ceramic tiles. For information on the Taba Standards Working Group, contact the Office of International and Academic Affairs, A505 Administration Building, NIST, Gaithersburg, MD 20899-0001, (301) 975-3069, fax: (301) 975-3530, e-mail: OIAA@nist.gov.

U.S., EGYPT TEAM ON STANDARDS/ METROLOGY EFFORT

Officials from Egypt and the United States are working to foster cooperation in standards and metrology activities in support of a major government effort to improve scientific and technical collaboration between the two countries. The cooperative effort could lead to increased economic development between the two countries. The cooperative activity started with the U.S.-Egypt Bilateral Workshop on Metrology, Standards and Conformity Assessment held in Alexandria, Egypt. U.S. participants included standards, measurement, and calibration experts from NIST, the National Conference of Standards Laboratories, Underwriters Laboratories Inc., and U.S. firms involved in quality assurance services. Egyptian representatives were from the Egyptian National Institute of Standards, the Egyptian Office of Standards, and the private sector. Plans call for a multilateral workshop in December 1996 to include participation by Egypt, Israel, Jordan, Morocco, Oman, the Palestinian Authority, Saudi Arabia, Tunisia, Turkey, and the United States. The thrust will be to develop a regional North African and Middle Eastern cooperative effort in metrology. For information, contact the Office of International and Academic Affairs,

A505 Administration Building; NIST, Gaithersburg, MD 20899-0001, (301) 975-3069, fax: (301) 975-3530, e-mail: OIAA@nist.gov.

UPDATED CATALOG HIGHLIGHTS NEW NIST TECHNOLOGIES

The NIST Technology Development Program recently detailed three new inventions in an update to its 1996 Inventions Catalog. This addendum to the volume issued earlier this year describes the following NIST technologies (and their advantages over comparable technologies) now available for licensing:

- NIST Docket No. 95-009CIP—provides an improved test structure for measuring width, spacing, or similar geometric characteristics of conductive lines formed on substrates in semiconductor manufacturing. It also enables the calibration of instruments used for such measurements;
- NIST Docket No. 95-054—greatly reduces probe-related measurement uncertainties in touch trigger probes used on commercial coordinate measuring machines; and
- NIST Docket No. 96-016PA—improves the efficiency and cost effectiveness of producing solid-state thermoelectric cooling and refrigerating devices as an alternative to chlorofluorocarbon refrigerants.

Copies of the 1996 NIST Inventions Catalog and/or its update are available from Marcia Salkeld, Industrial Partnerships Program, Building 820, Room 213, NIST, Gaithersburg, MD 20899-0001, (301) 975-4188, fax: (301) 869-2751.

FEDERAL R&D PROGRAMS REPORT NOW ON-LINE

The materials research and development programs of nine federal departments and agencies are described in a new report, 1995, The Federal Research and Development Program in Materials Science and Technology. This comprehensive look at the current federal materials R&D effort is available on-line through the World Wide Web. It is a guide for materials researchers in industry, government, and universities to the programs, people, and resources that make up the more than $2 billion-a-year materials R&D effort. The emphasis in the report is on R&D directly linked to industrial applications, particularly in the national priority areas of aeronautics, automotive technology, electronics, environmental technology. Organizations listed are: the Departments of Agriculture, Commerce, Defense, Energy, Health, and Human Services, Interior, and Transportation; and independent agencies NASA and the National Science Foundation. The report can now be accessed on the NIST Materials Science and Engineering Laboratory's WWW homepage, http://www.msel.nist.gov. Just click on the report's title in the "Technology Policy and Assessment Reports" section. It also is available on CD-ROM and in a printed form. For information, contact Samuel J. Schneider, B309 Materials Building, NIST, Gaithersburg, MD 20899-0001, (301) 975-5655, fax: (301) 926-8349, e-mail: samuel.schneider@nist.gov.

ENERGY-RELATED INVENTIONS PROGRAM MAKES RECOMMENDATIONS

During June 1996, the NIST Office of Technology Innovation recommended two innovative technologies for commercialization to its Department of Energy partner under the Energy-Related Inventions Program.

- Down-Hole Production Pump and Circulation System. The patented invention relates to the production of oil and gas wells, particularly stripper wells and those producing heavy crude oil.
- A New Casting Technology for Metallurgically Bonding Aluminum Base Inserts within Aluminum Castings. This is a process to eliminate the oxide interfacial layer usually formed between the insert and the metal when an aluminum (or aluminum alloy) insert is cast in an aluminum (or aluminum alloy) part in a die-casting operation.

NIST COMPLETES POLARIZATION MODE DISPERSION ROUND ROBIN USING NIST ARTIFACT

NIST recently completed a round robin for the measurement of polarization mode dispersion, or PMD, that shows significant improvements in measurement precision by using stable PMD artifacts. PMD is a property of fibers that causes signal distortion and limits data transfer rates in telecommunication systems and is currently the most debated topic in optical fiber metrology. The debate stems from the inherent statistical nature of PMD that prevents repeatable measurements on typical communication fibers. This limit to precision hinders instrument calibration as well as experimental verifications of theory. A recent poll among interested members of the Telecommunications Industry Association (TIA) identified PMD as the industry's first choice for development of a NIST Standard Reference Material (SRM).

From 1994 to 1996, NIST conducted the round robin under the coordination of the TIA to test the agreement between various participants for measurements on a stable artifact and to test a prototype PMD artifact designed and built by NIST. The round robin involved 16 participants from the United States, Europe, and Japan measuring three PMD specimens using one or more of four different measurement techniques. The specimens used were a single quartz waveplate, the NIST artifact made of a stack of 12 quartz waveplates, and a spool of 25 km of typical communication fiber. Results showed that measurements on the non-fiber artifacts yielded precisions that were less than one-third those for the fiber spool. NIST is using the results of the round robin to modify the design of its PMD artifact to simulate more closely a typical fiber specimen. Work is under way toward developing the artifact as an SRM.

NEW TECHNIQUE FOR ANALYZING GAS-PARTICLE FLOWS

A new computational technique for analyzing dilute gas-particle flows has been developed by researchers at NIST. Dilute gas-particle flows are industrially important in such diverse areas as furnaces, chemical reactors, and pollution studies. Previous computational techniques have analyzed the motion of particles through a flowing gas by calculating individual particle trajectories, a tedious and time-consuming task. The new technique developed at NIST utilizes dynamical systems theory to obtain predictions of particle behavior globally in a much more efficient manner. The effectiveness of this new technique has been demonstrated by computing the flow of contaminant particles through a chemical vapor deposition reactor of a type commonly used in the semiconductor fabrication industry. The joint NIST is focused presently on extending this work to the area of particle mixing in a highly unsteady flow configuration typical of combustors or furnaces.

SHEDDING LIGHT ON SURFACE REACTIONS

NIST scientists recently have explored how intense, femtosecond laser pulses promote the desorption of CO from Cu(100) surfaces. The chemical reactions of small molecules on metal surfaces are critical to a variety of fields, including heterogeneous catalysis, process sensors, and corrosion. Understanding these reactions represents a fundamental challenge, as neither the small cluster models of ab initio quantum chemistry nor the infinite Bravais lattice models of solid-state physics are strictly appropriate to the reduced symmetry of a surface.

A 150 fs desorption laser pulse was used to super heat the Cu electrons in the substrate to temperatures above 3000 K. Laser-based spectroscopy established that the energy content of the gas phase CO product was small, characterized by a temperature of only 225 K. This remarkable result could be modeled empirically by frictional coupling between the CO and both the Cu electrons and phonons using coupling parameters determined at NIST in earlier measurements. Importantly, the principal results of the NIST experiment had been predicted previously by state-of-the-art dynamics calculations with no adjustable parameters. The calculations, performed at University of California at Berkeley, agree to within a factor of two with the NIST results, which is encouraging given the complex nature of surface chemical phenomena. The NIST experiments will serve as a benchmark for the further refinement of theories of surface reactions. The development of such predictive theories could revolutionize the current design paradigm of surface chemical processes.

SIX NIST AUTHORS CONTRIBUTE PROMINENTLY TO NEW AMO PHYSICS HANDBOOK

The American Institute of Physics has just published for the first time a handbook on atomic, molecular, and optical (AMO) physics. Six NIST staff members have contributed chapters on atomic spectroscopy lineshapes and radiation transfer, tests of fundamental physics, quantum optical tests of the foundations of physics, and laser spectroscopy in the submillimeter and far-infrared region. This approximately 1100-page volume, which is also available on CD-ROM, is intended to be the definitive source book for virtually every aspect of atomic, molecular, and optical physics and is certain to become widely available on the book shelves of researchers in this field. It is a truly encyclopedic compendium of basic AMO physics terms, formulas, techniques, and key data.

NEAR-FIELD SCANNING OPTICAL MICROSCOPY: NANOMETER-SCALE CHARACTERIZATION OF OPTICAL FIELDS

Near-field scanning optical microscopy (NSOM) enables noninvasive optical measurements on previously inaccessible length scales. The spatial resolution is limited not by the wavelength, as it is in diffraction-limited techniques, but by the size of the sub-wavelength scanning aperture or tip used as a probe. While the potential impact of NSOM is enormous—companies already are marketing near-field microscopes—its

usefulness is limited because contrast mechanisms and resolution are poorly understood or ill-defined. In order to develop NSOM as a quantitative measurement tool, a team of scientists at NIST are determining the fundamental mechanisms that generate contrast in different materials and modeling the fields around small light sources as they interact with various materials and surface features.

In collaboration with the University of Virginia and the Naval Research Laboratory, NIST researchers have used NSOM to measure the nanoscale optical properties of a nanochannel glass array. The array is a type of two-dimensional photonic crystal composed of two glasses. A triangular lattice of one glass (the channel glass) is embedded in another glass (the matrix glass). NSOM images recorded with aluminum-coated fiber optic probes clearly show the array structure. Since the lattice constants for the nanochannel array are on the order of the wavelength of light, studying their structure using ordinary optical techniques is not possible. The NSOM measurements, supported by quantitative models, clearly show sensitivity to the local density of photon states in the array, which in turn depends on such properties as the index difference between the two glasses, the geometry of the crystal, and the composition of an interdiffusion layer between the two glasses. By varying the photon energy and the numerical aperture of the collection optics,, contributions are observed from different optical modes of the coupled array.

In addition to the utility of periodic dielectric structures as test systems for NSOM, analogous photonic crystals can serve as components in photonic switches and filters. A more detailed understanding of their electromagnetic mode structure can assist design of optical properties of the crystals such as transmission or reflection ranges, through modification of their periodicity or defect structure. NSOM provides an innovative, complementary probe of their optical properties.

HYDRATION REACTION OF NEUTRON SCATTERING USED TO STUDY THE MODEL CEMENT COMPOUND

The urgency of renewing the nation's aging transportation infrastructure has stimulated renewed interest in the materials science of Portland cement concrete. Of critical importance is how the material develops its strength as a function of time, chemical composition, and ambient environmental conditions. Recently NIST scientists, in collaboration with scientists from the Federal Highway Administration, have used quasielastic and inelastic neutron scattering in a time-dependent study of the hydration reaction in tricalcium silicate, the main chemical constituent of Portland cement. Data obtained using these techniques directly reflect the bonding state of water and hydrogen in the system. The quasielastic scattering demonstrates that the water is bound in at least two stages. The first begins immediately after mixing and corresponds to the confinement of water molecules as the sample sets. The second stage, identified using inelastic neutron scattering, corresponds to the formation of hydroxyl groups. NIST data show that hydroxyl formation begins only after a significant time delay (as much as two days) whose duration is quite sensitive to temperature and atmospheric conditions.

An MPEG movie of the time evolution of two quasielastic neutron scattering spectra can be viewed on the web at http://rrdjazz.nist.gov/~saf/cement.html.

DETERMINATION OF THERMAL CONDUCTIVITY OF LAYERED CERAMIC COATINGS

Ceramic thermal barrier coatings allow efficient high-temperature operation of a variety of turbine engines, especially in aircraft and aerospace applications. The coatings are deposited onto metallic substrates by a variety of techniques, the most popular being plasma spray. As engine temperatures increase, accurate measurement of the thermal properties of the coatings becomes increasingly critical. NIST has developed a unique apparatus to measure absolute steady state thermal conductivity of these coatings from 100 °C to above 1000 °C. Common industrial techniques measure the thermal diffusivity and then calculate the thermal conductivity using "known" values of density and specific heat, but the complexity of the coatings is such that these parameters are not well represented by handbook values and the resulting conductivity data may not be sufficiently accurate. Thus, an absolute measurement method is desirable. To confirm the NIST apparatus operation an industrial-type monolithic, plasma-sprayed 8 % yttria-stabilized zirconia (YSZ) coating on a stainless steel substrate was measured. Next, a functionally graded material (FGM) consisting of a 1.1 mm thick linearly graded coating of 80Ni20Cr alloy to 8 % YSZ on a stainless steel substrate was measured. The NIST researchers believe that this is the first absolute, steady-state thermal conductivity measurement of an FGM. Collaborations with major industrial engine producers to evaluate a range of developmental coatings are under way.

POLYMER BLENDS AND PROCESSING CENTER ESTABLISHED

NIST has established a new Polymer Blends and Processing Center for communication with and technology transfer to a broad range of industrial partners. The specific focus of the center will be the efficient adoption of measurement technologies developed at NIST and the timely assessment of new research directions for the Polymer Blends and Processing program at NIST. The center is an outgrowth of the successful completion of two industrial consortia, the Polymer Blends Consortium and the Measurements for Polymer Processing Consortium. The center will allow greater participation by industrial scientists than was possible under the consortia agreements. Results achieved by the two consortia were presented to approximately 20 scientists from various segments of the polymer industry during the kick-off meeting of the center.

The Polymer Blends Consortium focused on industrial problems concerning polymer blends and blends processing. Development of measurement technologies applicable to these problems was a key element of the efforts at NIST, and the transfer and implementation of these measurement technologies was a principal focus for industrial involvement. Instrument development by NIST staff included shear light-scattering instrumentation with complementary phase contrast optical microscopy and fluorescence microscopy capabilities, a high-pressure cell for optical birefringence and small-angle neutron scattering studies, and light scattering and optical microscopy detection on-line with a twin screw extruder.

The Measurements for Polymer Processing Consortium had the objective to develop sensors for real-time process monitoring based on optical measurement methods. A method was developed to measure the previously inaccessible temperature profiles within polymer resins during processing. In-situ resin temperature measurements were achieved by using the sensitivity of the fluorescence spectrum of dyes mixed with polymer resins at low concentrations in combination with con-focal optics designed to fit into the standard size instrumentation port on processing machines.

NIST MELTING STUDIES FOR IMPROVED SUPERCONDUCTING OXIDE WIRES AND TAPES

High T_c phases in the Bi-Sr-Ca-Cu-O (BSCCO) system are the basis for a substantial government, industry, and university R&D effort aimed at the fabrication of superconducting wires and tapes for commercial applications. The first such high T_c product, superconducting leads for MRIs, is already on the market. Other potential applications envisioned are windings in superconducting motors, magnets, and transformers in which efficiencies can be boosted significantly. Industry has found that optimal processing of raw materials into superconducting wires and tapes requires the presence of a liquid phase to achieve the necessary levels of intergranular alignment and connectivity. Phase equilibrium data are essential for choosing appropriate starting chemical compositions and processing temperatures. NIST researchers recently have determined the liquidus surface of the four-component BSCCO 2212 superconductor, nominally $Bi_2Sr2CaCu_2O_x$ (2212). In the Bi_2O_3-SrO-CaO-CuO compositional space, the 2212 liquidus forms a closed volume with a complex shape. The surface provides compositional and temperature data essential for crystallizing 2212 directly from the melt. Furthermore, by guiding the crystallization path to the surface of the liquidus volume, the presence of second-phase impurities, useful as magnetic flux pinning centers, may be controlled. NIST phase diagram data support the efforts of collaborators at two other laboratories working in wire development programs.

NIST DEVELOPED ELECTRON HOLOGRAPHY SOFTWARE AVAILABLE

Electron holography in the transmission electron microscope offers a unique perspective of materials by revealing the phase of high energy, highly coherent electrons interacting with matter. Electron holography is capable of quantitatively measuring phenomena such as the magnetic fields inside superconductors (the flux-line lattice) and electric fields emanating from pn junctions in semiconductor materials. Extraction and interpretation of the information in holograms requires that the phase be reconstructed via digital algorithms. NIST scientists recently developed and made available to the scientific community HolograFREE™, a software package for fast, numerical reconstruction and analysis of holograms. This software allows extraction of quantitative phase (and amplitude) information, phase amplification, and precise phase alignment. A detailed knowledge of the phase information can provide a quantitative measure of specimen thickness, surface topography, mean inner potentials of materials, dislocation strain fields and nanodiffraction as well as electron microscopy lens aberrations. Current research on multi-layer thin films such as giant magneto-resistive materials employs holography to investigate the relationships between atomic structure and magnetic properties.

MATRIX MARKET UNVEILED

NIST scientists recently made available on the World Wide Web an initial version of the Matrix Market (http://math.nist.gov/ MatrixMarket/). Produced at NIST to develop reference data and related services for mathematical and statistical software, the Matrix Market is a visual database of matrices and related data for use in the testing and evaluation of algorithms and software for core linear algebra computations such as the solution of linear systems and eigenanalysis. Of particular interest are very large sparse matrices from industrial applications such as aircraft modeling, oil exploration, and circuit design.

The collection was seeded with some 300 matrices originally collected by colleagues at two other organizations. The Matrix Market, which provides matrix classification and searching based on matrix properties (e.g., symmetry, size, sparsity, problem domain) as well as references and illustrations of sparsity structure, has become the official distributor of the Matrix Collection of the two other organizations. Although only a few months old, the Matrix Market has had nearly 2500 visitors. Work is under way to collect additional matrix problems and to add new capabilities to the system.

NIST PARTICIPATES IN VIDEO-ON-DEMAND INTEROPERABILITY TEST

NIST recently participated in the Digital Audio-Visual Council (DAVIC) Interoperability Test Event at the Image Technology for New Media Center at Columbia University in New York City. The event was held in parallel with the 13th DAVIC meeting. DAVIC is an international consortium established to develop specifications for, and to promote interoperability of, digital video applications.

On the first day, more than 200 people viewed the demonstration of the Video-on-Demand (VoD) Interoperability Test Laboratory facility constructed by NIST. The purpose of the test event was to show that DAVIC-compliant equipment could interoperate. A total of eight companies from the United States, Europe, and Japan participated in the event, interconnecting their VoD components, video server and Set-Top-Unit (STU), via an ATM network. Equipment used in the demonstration consisted of prototype implementations using either workstations or high-end personal computers. The STUs from other participants successfully accessed NIST's video server, and NIST's STU interoperated with Columbia's server. NIST announced at the closing plenary of the DAVIC meeting that NIST is ready to conduct interoperability tests with other parties at its laboratory.

NIST EXPLORES DISTRIBUTED COMMUNICATION METHODS FOR USE IN HEALTH CARE APPLICATIONS

NISTIR 5820, Distributed Communication Methods and Role-Based Access Control for Use in Health Care Applications, documents the results of an investigation into the suitability of several different distributed access mechanisms for health care information. Health care data are often distributed across different computers and networks, and information about individuals must be protected to safeguard privacy and the integrity of the information. The study examined five mechanisms and compared them for use in health care applications. The use of role-based access control in health care was also examined.

NIST AND SEMATECH JOIN FORCES TO PRODUCE AN ELECTRONIC STATISTICAL HANDBOOK

NIST statisticians met recently in San Antonio, Texas, with the SEMATECH Advisory Council for a progress report on a joint NIST/SEMATECH venture to produce an electronic statistical handbook. To be disseminated via the Internet, the handbook will provide access to modern statistical and graphical techniques for solving engineering problems. A demonstration for the council focused on integration between viewing the handbook with a web browser and doing real-time computations with the public domain software package Dataplot. The council supports the project and will provide reviewers from the member companies for individual chapters of the electronic handbook.

OPTICAL CHARACTER RECOGNITION RESEARCH ADVANCES

NISTIR 5843, Component-Based Handprint Segmentation Using Adaptive Writing Style Model, describes a new character segmentor designed by NIST, which is based on statistically modeling the style of a person's handwriting. Simple spatial features, such as the thickness of the pen stroke and the height of the handwriting, capture the characteristics of a particular writer's style of handprint, enabling the new method to maintain a traditional character-level segmentation philosophy.

Researchers integrated the new segmentor into the NIST public domain Form-Based Handprint Recognition System and tested it on a set of 490 Handwriting Sample Forms found in NIST Special Database 19. When compared to a simple component-based segmentor, the new adaptable method improved the overall recognition of handprinted digits by 3.4 % and field

level recognition by 6.9 %, while effectively reducing deletion errors by 82 %. The new segmentor operates very efficiently and significantly improves segmentation.

RELEASE OF SPARSE MATRIX SOFTWARE

As part of the ongoing standardization efforts of the Basic Linear Algebra Subprogram (BLAS) Technical Forum, NIST has announced a software package for low-level sparse matrix computations for public review. The NIST Sparse BLAS package consists of over 1300 routines supporting linear algebra for various sparse matrix storage schemes.

Many physical modeling and simulation problems give rise to large sparse linear systems, and these are frequently the computational bottleneck of an application code. The availability of efficient low-level BLAS routines is, therefore, of keen interest to computational scientists and scientific computing vendors.

The BLAS Technical Forum is a multidisciplinary group with commercial participants as well as participants from universities and research centers. The forum is working on the establishment of interface standards to enable libraries for sparse and parallel linear algebra computation to interoperate easily and efficiently.

More information about the NIST Sparse BLAS effort can be found at "http://math.nist.gov/spblas."

SQL TEST SUITE, VERSION 6.0, BETA TESTING

The NIST SQL Test Suite is being enhanced to include tests for conformance to the Intermediate SQL level of Database Language SQL, ANSI X3.135-1992 and ISO/IEC 9075:1992. The current Version 5.1 of the test suite validates conformance to lower levels of the standards: Transitional SQL (defined in FIPS 127-2), Entry SQL (FIPS and ISO), and X/Open Profiles. CSL/ CAML uses Version 5.1 to validate SQL products for procurement and publishes the list of validated SQL products in the Validated Products List.

New tests for Intermediate SQL were developed under the CTS5 SQL2 Project sponsored by the European Community. The CTS5 partners National Computing Centre (United Kingdom) and Computer Logic R&D (Greece) designed and wrote programs to be incorporated into the existing Version 5.1 of the NIST SQL Test Suite. NIST is reviewing and enhancing the programs, as well as writing more programs for comprehensive coverage, in preparation for beta testing. The SQL Test Suite, Version 6.0, is planned for release on Dec. 31, 1996.

The goal of beta testing is to provide the opportunity for the SQL community to contribute to the quality and coverage of the proposed tests. Errors in the test programs, deficiencies in coverage, misinterpretations of the standard, and errors in the standard itself may be corrected as a result of this review process.

GOAL OF NEW PARTNERSHIP: SAFER CARS

NIST has joined forces with a major automobile manufacturer in a 2 year project to improve motor vehicle fire safety. Under terms of the recently signed cooperative research and development agreement, researchers from NIST and the automobile manufacturer's research and development center will evaluate the fire safety aspects of vehicle crash and fire tests, identify potential mechanisms by which fires could start, and then create laboratory models of these mechanisms. The data derived will enable researchers to characterize fire properties of potential combustibles in vehicles, determine fire growth paths and time lines, and evaluate fire hazards to vehicle occupants. The automobile manufacturer and NIST will use this knowledge to study both passive protection measures (such as less flammable materials in critical locations and improved fire barriers) and active fire suppression technologies. For technical information on the collaborative effort, contact Richard Gann, B250 Polymer Building, NIST, Gaithersburg, MD 20899-0001, (301) 975-6866, e-mail: richard.gann@nist.gov; or Douglas Kononen, GM, 30500 Mound Rd., Warren, MI 48090-9095, (810) 986-1351, e-mail: dkononen@cmsa.gmr.com.

INDIANA NOW LINKED TO NATIONWIDE NETWORK

NIST and a private company recently signed an agreement making Indiana a part of the Manufacturing Extension Partnership. As result of this agreement, the state's 10 000-plus smaller manufacturers are connected to a nationwide network of tools and services to assist them in becoming globally competitive. Unlike other MEP affiliates, the Indiana company does not receive any federal funding; instead, it is primarily supported by state and private partners. The new affiliate did have to meet the same criteria for excellence and quality as all other MEP members. During the past 4 years, the Indiana company's 14 regional manufacturing centers have helped more than 4000 state businesses increase sales by $160 million, reduce costs by almost $18 million, and create or improve nearly 134 000 jobs. The Indiana company may be reached at (317) 635-3058.

CONNECTIONS WITH REFLECTIONS CAUSE ERRORS

A study by NIST scientists has found that users of optical fiber power meters can expect as much as a 10 % error if the meter is used with a connector different from that used to calibrate the meter. The error sources, NIST found, are reflection properties of the detectors, windows, and connectors involved. When the power incident on an optical fiber power meter is measured, radiation is transmitted through a fiber attached to the detector by a fiber connector and adapter. The closeness of the fiber connector to the detector—and its associated window—provides an opportunity for reflections that introduce errors in the power readings. To perform its study, NIST selected six common connector types from four randomly chosen vendors. Calibrations were performed on four types of power meters at three telecommunications wavelengths: 850 nm, 1310 nm, and 1550 nm. "We found significant measurement offsets resulting from the use of various connectors and a variability within a single connector type obtained from different vendors," the NIST researchers reported. "It is very important to calibrate an optical fiber power meter with the same type of a connector used in the actual measurement." For a copy of paper no. 25-96 outlining their results, contact Sarabeth Harris, Div. 104, NIST, Boulder, CO 80303-3328, (303) 497-3237, e-mail: sarabeth@micf.nist.gov.

ELECTRONIC MATERIALS GROUP URGES R&D COOPERATION

In an effort to improve the competitiveness of the U.S. electronics industry, materials experts from industry, government, and universities met at a recent workshop to identify dominant issues facing industry and critical to its advancement in the international marketplace. These experts called for greater cooperation between industry and government in electronic materials research and development. The workshop was held by an organization of representatives from government agencies supporting various electronics programs. Recommendations and other findings by the experts are given in a new report, Beyond the Technology Roadmaps: An Assessment of Electronics Materials Research and Development. Copies of the report, NISTIR 5777, are available from Michael A. Schen, B320 Polymer Building, NIST, Gaithersburg, MD 20899-0001, (301) 975-6741, fax: (301) 869-3229, e-mail: michael.schen@nist.gov.

STRESSED OUT MEASURING FORCE? THEN VIBRATE!

The conventional way to measure large forces is to utilize resistive strain gages cemented to metal load-bearing elements (load cells). Scientists at NIST have come up with a better way: using noncontacting electromagnetic acoustic transducers (called EMATs) to detect resonant vibrational frequencies that change with applied stress. A solid aluminum cylinder, specially designed to have vibrations "trapped" in a central section, serves as the load-bearing element. One advantage is higher resolution. Also, since the resonant frequencies are properties of the load-bearing element, errors arising from coupling with the transducer and aging of the transducer are not issues. By contrast, degradation of the bonding agent and deformation of strain gages can affect the accuracy of conventional measurements. Other advantages of vibrational spectroscopy include insensitivity to bending moments and durability in harsh environments. For paper no. 26-96, which describes the vibrational spectroscopy measurement technique, contact Sarabeth Harris, Div. 104, NIST, Boulder, CO 80303-3328, (303) 497-3237, e-mail: sarabeth@micf.nist.gov.

CONSORTIUM SEEKS BEST WEAR RESISTANCE FOR IMPLANTS

Medical implants such as artificial joints have restored quality of life and movement for millions with orthopedic disorders over the years. The wear resistance of the material used to create these devices is critical to their success. If the material wears down, the degradation may cause osteolysis (the dissolution of bone tissue) or lead to failure of the implant altogether. NIST is teaming with six orthopedic medical device manufacturers in a cooperative effort to identify the best test methods for screening new wear-resistant materials. The work of the Orthopedic Accelerated Wear Resistance Consortium also is expected to significantly shorten the time it takes to select new materials and get them approved for use in medical implants. For information on the consortium, contact John A. Tesk, A143 Polymer Building, NIST, Gaithersburg, MD 20899-0001, (301) 975-6799, e-mail: john.tesk@nist.gov.

NEW TOOL MAY LEAD TO OVERLAY STANDARDS

The origin of a unique NIST instrument is a semiconductor industry necessity: high-accuracy measurement

tools to ensure precise alignment of the intricately patterned photomasks defining a computer chip's complex circuitry. During the sequential, level-by-level micropatterning process, misalignments greater than 10 % of the size of the smallest feature on a chip—a shrinking target that now stands at 0.35 μm—can jeopardize yields. NIST researchers have built a unique "overlay metrology system" to characterize types of misalignment errors, and later, to produce the quality-assuring measurement artifacts requested by industry. Producing full-field views or series of point-to-point, three-dimensional images gathered during scans of silicon-wafer-sized samples, the system's confocal microscope is mounted on a vibration-reducing platform, supported by NIST-patented strut joints that greatly simplify adjustments. Interferometers track sample movements in three dimensions, measuring displacements as small as 0.6 nm, the radius of about two atoms. A high-resolution digital camera and photometer also provide essential measurement data. Once NIST researchers determine the relative contributions of equipment imperfections and sample irregularities to measurement uncertainty, they will develop standard reference materials containing features with relative displacements measured with nanometer-scale accuracy. With these and other planned standard references, companies will calibrate the on-line optical microscopes used to check the alignment of photomasks. For more information, contact Rick Silver, A107 Metrology Building, NIST, Gaithersburg, MD 20899-0001, (301) 975-5609, email:richard. silver@nist.gov.

PROPOSALS SOUGHT FOR PRECISION MEASUREMENT GRANTS

Project proposals are now being accepted for two research grants for fiscal year 1998 in the field of precision measurement and fundamental constants. The NIST Precision Measurement Grants are awarded annually to faculty members at U.S. universities or colleges for work in determining values for fundamental constants, investigating related physical phenomena, or developing new, fundamental measurement methods. Each grant of $50 000 for 1 year may be renewed by the agency for up to 2 additional years for a total of $150 000. Prospective candidates must submit summaries of their proposed projects and biographical information by Feb. 3, 1997. For proposal requirements and other information, contact Barry N. Taylor, B161, Technology Building, NIST, Gaithersburg, MD 20899-0001, (301) 975-4220.

COMMENTS SOUGHT ON WOOD PRODUCTS PROGRAM

The NIST National Voluntary Conformity Assessment System Evaluation (NVCASE) program has received a request from a private company, to develop a program to evaluate and accredit third-party product certification bodies which inspect and certify structural use panels and engineered wood products. The proposed program would provide a U.S. counterpart to similar operations currently run by the Canadian and Japanese governments. A NVCASE program would allow testing and certification performed in the United States to be accepted in Canada and Japan. This is because Canada and Japan will only accept a Federal Government program that parallels their own national certification systems. For information or to submit comments on the proposed NVCASE program, contact Robert L. Gladhill, Building 820, Room 282, NIST, Gaithersburg, MD 20899-0001, (301) 975-4273, fax: (301) 963-2871, e-mail: robert.gladhill@nist.gov.

FASTENER PROGRAM UNDER WAY TO PROTECT PUBLIC

A national program to protect public health and safety by ensuring that certain nuts, bolts and other fasteners used in critical situations (such as attaching aircraft engines to fuselages) conform to specifications was launched on Sept. 26, 1996, with the publication in the Federal Register of the final rule of the Fastener Quality Act of 1990. The announcement calls for the rule to become effective on Nov. 25, 1996, and the act to become official on May 27, 1997. The interval will give NIST and others time to accredit laboratories that test fasteners. The act protects public safety by (1) requiring that fasteners covered by the legislation conform to exact specifications, (2) providing for accreditation of laboratories engaged in fastener testing, and (3) requiring inspections, testing, and certification of fastener manufacturers. The procedures to implement the Fastener Quality Act of 1990 (Title 15, Part 280 of the U.S. Code of Federal Regulations) may be obtained from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402, (202) 512-1800. The regulations, Federal Register notices and copies of the act may be accessed on the World Wide Web at http://www.nist.gov/fqa. For information on the FQA program, contact Subhas Malghan at (301) 975-4500.

SMOKIES GO SOLAR WITH NIST HOT WATER DEVICE

A novel NIST solar water heating system that uses photovoltaic cells in combination with computer technology is now hard at work in Tennessee's Great Smoky Mountains National Park. The device recently was installed at the park's Sugarlands Visitor Center near Gatlinburg, TN, in a joint project involving NIST, the U.S. National Park Service, the Tennessee Valley Authority, and the Sevier County (TN) Electric System. Participants hope that the year-long test of the photovoltaic solar water heater will considerably reduce the visitor center's water heating energy consumption while providing valuable "on-the-job" field data to researchers looking to improve the technology. Two ongoing tests of the solar water heater—at NIST's Gaithersburg, MD, headquarters and at the Florida Solar Energy Center in Cocoa, FL—led to refinements in earlier versions of the device that resulted in the model installed in Tennessee. The NIST technology, patented in 1994, features a microprocessor that continuously monitors solar conditions and directs energy produced by the photovoltaic cells to various combinations of resistive heating elements. The process ensures that the cells operate near maximum conversion efficiency. For more information, contact A. Hunter Fanney, (301) 975-5864, e-mail: hunter.fanney@nist.gov.

Standard Reference Materials

SRM 2073A, SINUSOIDAL ROUGHNESS SPECIMENS, CERTIFIED AND RELEASED

Standard Reference Material (SRM) 2073a for sinusoidal roughness recently was certified and released for distribution to the public. This SRM is required by industry for calibrations of roughness measurements performed in the automobile, aerospace, and other mechanical parts industries. SRM 2073a is a steel block with an electroless nickel coating in which a sinusoidal roughness pattern was machined by numerically controlled diamond turning. The SRM is one of a series of five SRMs, which are certified for average roughness height (Ra) and surface spatial wavelength (D). The nominal Ra of SRM 2073a is 3 μm and was measured on each specimen with a relative expanded uncertainty of 1.1 % (calculated as two times the relative combined standard uncertainty). The nominal spatial wavelength is 100 μm and was measured on each specimen with a relative expanded uncertainty of 0.033 %. The first series of SRM 2073, consisting of 100 units, was issued in 1985 and sold out.

NIST ASSIGNS VALUES FOR METHYLMERCURY IN SEVERAL ENVIRONMENTAL SRMs

Researchers at NIST recently addressed a critical need in the environmental arena by providing certified values for methylmercury in several mussel tissue Standard Reference Materials (SRMs). Many damaging chemicals have been introduced into the marine environment during the past few decades. Organomercurials are among the most toxic of these contaminants due to their tendency to accumulate in biological tissues. A large number of environmental monitoring programs analyze marine sediments and biological materials for methylmercury, the most toxic organomercurial routinely found in marine samples. A limited number of certified reference materials (CRMs) with values for methylmercury are currently available; however, none of these materials were generated at NIST. More CRM matrix types with a wider range of methylmercury concentrations are needed desperately for quality assurance and method development in this field.

Three mussel tissue materials, SRM 1974a Organics in Mussel Tissue, SRM 2974 Freeze-dried Mussel Tissue, and RM 8044 Mussel Tissue, were analyzed at NIST for methylmercury content using an element-specific analytical method based on gas chromatography with atomic emission detection. These materials also were provided to the International Atomic Energy Agency, Marine Environment Laboratory (Monaco), and the Institute for Applied Physical Chemistry, Research Centre of Jülich (Germany) for determination of methylmercury by methods independent from the NIST method. The data from the three laboratories then were combined to form certified methylmercury values for all three materials.

SRM 1974a, SRM 2974, and RM 8044 are the first natural matrix environmental SRMs with certified metal speciation values. The three materials also are the first mussel tissue matrix CRMs certified for methylmercury content available to date. Mollusks often are used in environmental monitoring programs, so these materials will play an important role in quality assurance for data collection in these programs. Lastly, RM 8044 contains the lowest level of methylmercury found in a currently available biological matrix CRM. Development of other metal speciated environmental SRMs is planned to expand NIST's involvement in this growing field of analytical chemistry.

SPECIAL BROCHURES AVAILABLE FOR 16 PROGRAM GROUPS

NIST has prepared a series of special brochures that offer quick access to important information on Standard Reference Materials in 16 special categories. These materials are part of a total inventory of approximately 1300 SRMs currently available from NIST. Brochures are available in the following program areas: agriculture and food, analyzed gases, ceramics and glasses, environmental inorganic, environmental organic, ferrous metals, non-ferrous metals, health, industrial hygiene, ion activity, optical properties, metrology, polymers, powder diffraction, semiconductor and spectrometric. The NIST SRM program provides science, industry and government with a central source of well-characterized materials certified for chemical composition or for some chemical or physical property. SRMs are used to calibrate an apparatus or to assess a measurement method. Copies of the special brochures, as well as the general NIST Catalog of Standard Reference Materials (SP260), are available from the SRM Program, 204 Engineering Mechanics Building, NIST, Gaithersburg, MD 20899-0001, (301) 975-OSRM (6776), fax: (301) 948-3730, e-mail: srminfo@enh.nist.gov.

Volume 101, Number 5, September–October 1995
Journal of Research of the National Institute of Standards and Technology

Calendar

October 28–31, 1996
ANNUAL CONFERENCE ON FIRE RESEARCH

Location: National Institute of Standards and Technology
Gaithersburg, MD

Purpose: To report and discuss advances in fire science, with the intent of stimulating new products that are more fire-safe, and new ways to capture that value in product testing and approval for use.
Topics: Fire suppression, fire detection, fire plumes, flame spread, halons, numeric databases, polymers, pool fires, risk assessment, soot, toxicity, urban fires, and composites.
Format: Parallel sessions
Audience: All parties with an interest in advances in fire safety, including researchers on the fundamentals of fire behavior, fire safety, practitioners, and manufacturers of products potentially impacted by fire safety regulations.
Sponsor: NIST
Contact: Kellie Beall, NIST, Building 224, Room B250, Gaithersburg, MD 20899-0001, phone: 301/975-6864, fax: 301/975-4052, email: kellie.beall@nist.gov.

November 12–14, 1996
FOURTH ANNUAL MEETING OF THE COUNCIL ON IONIZING RADIATION MEASUREMENTS AND STANDARDS (CIRMS)

Location: National Institute of Standards and Technology
Gaithersburg, MD

Purpose: To advance and disseminate the physical measurements and standards needed for safe and effective technological application of ionizing radiation.
Topics: Medical applications, public/environmental radiation protection, occupational radiation protection, radiation effects.
Format: General sessions.
Audience: Representatives from academia, professional and industrial organizations; governmental department and agencies; and interested individuals involved in nearly every aspect of ionizing radiation.
Sponsor: NIST.
Contact: Bert Coursey, NIST, Building 245, Room C229, Gaithersburg, MD 20899-0001, 301/975-5584, email: bert.coursey@nist.gov.

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NIST Technical Publications

Periodical

Journal of Research of the National Institute of Standards and Technology—Reports NIST research and development in those disciplines of the physical and engineering sciences in which the Institute is active. These include physics, chemistry, engineering, mathematics, and computer sciences. Papers cover a broad range of subjects, with major emphasis on measurement methodology and the basic technology underlying standardization. Also included from time to time are survey articles on topics closely related to the Institute's technical and scientific programs. Issued six times a year.

Nonperiodicals

Monographs—Major contributions to the technical literature on various subjects related to the Institute's scientific and technical activities.

Handbooks—Recommended codes of engineering and industrial practice (including safety codes) developed in cooperation with interested industries, professional organizations, and regulatory bodies.

Special Publications—Include proceedings of conferences sponsored by NIST, NIST annual reports, and other special publications appropriate to this grouping such as wall charts, pocket cards, and bibliographies.

National Standard Reference Data Series—Provides quantitative data on the physical and chemical properties of materials, compiled from the world's literature and critically evaluated. Developed under a worldwide program coordinated by NIST under the authority of the National Standard Data Act (Public Law 90-396). NOTE: The Journal of Physical and Chemical Reference Data (JPCRD) is published bimonthly for NIST by the American Chemical Society (ACS) and the American Institute of Physics (AIP). Subscriptions, reprints, and supplements are available from ACS, 1155 Sixteenth St., NW, Washington, DC 20056.

Building Science Series—Disseminates technical information developed at the Institute on building materials, components, systems, and whole structures. The series presents research results, test methods, and performance criteria related to the structural and environmental functions and the durability and safety characteristics of building elements and systems.

Technical Notes—Studies or reports which are complete in themselves but restrictive in their treatment of a subject. Analogous to monographs but not so comprehensive in scope or definitive in treatment of the subject area. Often serve as a vehicle for final reports of work performed at NIST under the sponsorship of other government agencies.

Voluntary Product Standards—Developed under procedures published by the Department of Commerce in Part 10, Title 15, of the Code of Federal Regulations. The standards establish nationally recognized requirements for products, and provide all concerned interests with a basis for common understanding of the characteristics of the products. NIST administers this program in support of the efforts of private-sector standardizing organizations.

Order the **following** *NIST publications—FIPS and NISTIRs—from the National Technical Information Service, Springfield, VA 22161.*

Federal Information Processing Standards Publications (FIPS PUB)—Publications in this series collectively constitute the Federal Information Processing Standards Register. The Register serves as the official source of information in the Federal Government regarding standards issued by NIST pursuant to the Federal Property and Administrative Services Act of 1949 as amended, Public Law 89-306 (79 Stat. 1127), and as implemented by Executive Order 11717 (38 FR 12315, dated May 11, 1973) and Part 6 of Title 15 CFR (Code of Federal Regulations).

NIST Interagency Reports (NISTIR)—A special series of interim or final reports on work performed by NIST for outside sponsors (both government and nongovernment). In general, initial distribution is handled by the sponsor; public distribution is by the National Technical Information Service, Springfield, VA 22161, in paper copy or microfiche form.

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